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ABSTRACT

Sixty four college students participated in a study which sought to validate a set of predictions about story memory, derived from a story-grammar approach to comprehension. The grammar describes the higher-order structures regulating the organization and retrieval of incoming story information. These structures, defined by a basic set of rewrite rules, specify the types of information which should occur in stories and the types of logical relations which should connect story components. Recall and reconstruction tasks were administered, based on sets of well-formed, slightly disordered, and randomly ordered stories and on unrelated statements. Results of the study indicated that higher-order story structures exerted a significant influence over the accuracy of story memory and had a pronounced effect on the reorganization of stories not conforming to the story grammar. Implications of the deliberate use of these story structures in retaining incoming information were illustrated. (Author/AA)

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CENTER FOR THE STUDY OF READING

Technical Report No. 68

THE EFFECTS OF ORGANIZATION AND INSTRUCTIONAL SET ON STORY MEMORY

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The Effects of Organization and Instructional Set on Story Memory

In the past few years, it has become increasingly apparent that models of single word or sentence comprehension cannot account for many of the important factors affecting the comprehension of discourse material. Although theories of discourse comprehension must eventually explain how these smaller units influence the comprehension of an entire passage, an approach describing how the relationships between sentences are understood is necessary.

Building upon Bartlett's (1932) original work and Propp's (1958) morphology of the folktale, several story grammars have been constructed to describe the structural basis of story understanding (Kintsch & vanDijk, 1975; Mandler & Johnson, 1977; Rumelhart, 1975; Stein & Glenn, 1977; Thorndyke, 1977). The theoretical assumptions of these grammars specify that memory for stories is a constructive process, resulting from the interaction between incoming information and pre-existing cognitive structures, or schemata, containing knowledge about the generic characteristics of stories. These schemata, defined as a set of rewrite rules, specify how stories should be broken down into their component parts, the types of information which should occur at various locations in a story, and the types of causal relations which should connect story components. Schemata also allow a listener to determine whether parts of a story have been omitted and whether the correct temporal relations have been included in a story sequence. Thus, it is assumed that the text or surface structure of stories not conforming to the rules specified by a

schema will be transformed so that a representation, conforming more to a story schema, is constructed. The purpose of this study was to validate a set of predictions generated by the assumptions underlying the Stein and Glenn (1977) story grammar.

In our initial study of story comprehension in elementary school children (Stein & Glenn, 1977), we described the basic set of rewrite rules used to organize, represent, and retrieve incoming story information. In order to illustrate how these rules are used, we have presented an example of the way in which a simple story is broken down into its component parts and how the parts are related to one another.

The initial breakdown of a story is divided into two parts: a setting plus an episode. The setting begins the story with the introduction of a protagonist and normally includes information about the social, physical, or temporal context pertaining to the development of the episode. The setting is not part of the episode, as it is not directly related to the subsequent behavioral sequence described in the episode. However, information in the setting category may constrain the possible types of behavioral sequences which then occur.

The remaining story information in the episode consists of a sequence of five categories: initiating event, internal response, attempt, consequence, and reaction. The initiating event category contains some type of event or action which marks a change in the story environment. The major function of this change is to evoke some type of response from the protagonist which is defined as the internal response category. Internal responses can include goals, affective states and cognitions, and serve

to motivate a character's subsequent overt behavior. Actions which describe this overt behavior are defined as attempts. A character's attempts then result in the consequence which marks the attainment or non-attainment of the character's goal. The final category is the reaction which can include a character's response to the consequence or broader consequences caused by the goal attainment. If the relationship between the setting and episode is ignored, it is apparent that each category logically follows the preceding one. Furthermore, according to our grammar, these categories always occur in a specific temporal order.[1]

There are several factors which alert the listener to the fact that one category has ended and another one begun. Temporal markers such as, "One day, Suddenly, Finally, etc." often signal the beginning of a new category, facilitating the breakdown of stories into components. The semantic content of a statement and the relationships among statements, however, are just as important in determining the division among categories.

Effects of Temporal Organization

From the previous description, it is apparent that the temporal order of category information and the logical relations between categories are critical components of the definition of a story schema. The purpose of this study was to examine how story memory was affected by story texts which both conformed to and deviated from our proposed rule system. Specific predictions were made and tested by observing the patterns of story reproduction in both recall and reconstruction tasks. The first set of predictions concerned conditions where listeners were given explicit

instructions to recall both the semantic content of a story as accurately as possible and to reproduce the exact sequence of events occurring in a given story text.

If the text structure of a story corresponds to the "ideal" story structure described in our grammar, subjects should be able to reproduce a temporal sequence of events almost identical to the text structure. Data from recent studies (Mandler & Johnson, 1977; Stein & Glenn, 1977) have already indicated strong support for this prediction by showing that both adults and elementary school children have little difficulty recalling the correct story order of texts conforming to our proposed rule system. In the present study, then, adults should make few, if any, errors in recalling the correct order of stories matching our description of an ideal story structure.

Predictions were also made about the text structure of stories violating the rewrite rules embodied in an ideal story structure. The first type of text violation considered was a reordering of the category sequence described in an ideal story structure. Two instances of this violation were considered. The first concerned slightly-disordered stories where one story category was placed in a temporal location other than the one specified by our story grammar. The second concerned randomly ordered stories where statements from all categories were placed in a random sequence. The slightly-disordered stories represented a minimal order violation, whereas the randomly-ordered stories represented a maximal order violation. It is important to note that despite differences in

temporal organization, the same semantic information was included in the slightly-disordered and randomly-ordered texts.

A second type of text violation was examined: stories not conforming to the causal constraints of an ideal story structure. These type of stories contain similar types of information found in stories conforming to an ideal structure, but individual story statements are not causally related to one another. Statements occur in a specific temporal sequence, but no a priori reason exists to suggest that any one statement should precede or follow a second statement. In this type of text structure violation, the only logical connection between individual statements is the AND relation.

Predictions made about story order violations were as follows. First, the amount of accurate information recalled should decrease significantly as a function of the degree of story violation. Second, the recalled order of stories should reflect a reordering of statements to conform more to the order described in an ideal structure than to the order presented in the text. These predictions imply that exposure to story order violations may create difficulty in the processing of incoming information. Subjects expecting certain causal sequences to occur in stories may become confused when unexpected sequences occur, and as a result, spend more time resolving confusions than processing other parts of the story.

The degree of story order violation may also be a critical factor in determining how much reorganization occurs in recall. When a minimal order violation is heard, the influence of a story schema may be more

pronounced than when maximal order violations are heard. One of the subgoals of this study was to examine how different degrees of order violations affected story memory.

Predictions concerning text structures violating the causal rules described in our story grammar were more problematical. It was unclear as to how subjects would recall this type of text. As both Kintsch (1977; Kintsch & Kintsch, in press) and Mandler (in press) have stated, listeners are well aware of those situations where a story schema cannot be used (e.g. in recalling expository texts). Listeners may chose not to use a story schema to organize this type of information. As a result, however, the recall of accurate information may be seriously impaired.

Effects of Instructional Set

We also examined the effects of the deliberate use of a story schema on memory by varying the instructions given prior to stimulus presentation. One group of subjects was asked to maintain the exact order of the text material, while recalling as much accurate semantic information as possible. A second group was asked to recall the text information in the form of a "good, coherent story," while recalling as much of the semantic information as accurately as possible. In the treatment where subjects were asked to make a "good" story, texts violating the rules of a schema may be more accurately recalled than on a treatment requiring the maintenance of the exact order of story statements.

Asking subjects to make a "good" story has several advantages over an exact-ordering condition. This instructional set alerts listeners to

the fact that presented material may not be organized in an ideal form. Listeners can then directly impose an order on incoming information specified by the schema. By actively using the schema as an encoding and retrieval strategy, a more thorough search for specific category information can be initiated. In order to test this prediction, the effects of two instructional treatments were compared.

Method

Subjects

The subjects were 64 adults between the ages of 18 and 30 and were recruited from both undergraduate and graduate classes at Washington University. All subjects came from an upper middle-class socio-economic group; an equal number of males and females participated in the study.

Materials

The procedure for stimulus construction consisted of developing four different types of stories. In the first group of stories, each story contained the six basic categories and intercategory relations required of an ideal or well-formed story in the Stein and Glenn (1977) grammar. In order to equate the number of statements occurring within each of the six categories (setting, initiating event, internal response, attempt, consequence, reaction) all stories were written so that each category was represented by two statements. An example of the statements in a well-formed story appear in Table 1. In order to ensure the well-formed nature of each story, three judges independently classified the

information in a story into its component parts. The interrater reliability was above 95% in all cases.

Insert Table 1 about here

The well-formed stories were used to generate two additional sets of materials. These were: slightly-disordered stories and randomly-ordered stories. The slightly-disordered stories were constructed by moving the two consequence statements in each well-formed story to a position in the episode where they followed immediately after the initiating-event statements. This made the consequence statements occur in positions five and six rather than their normal positions of nine and ten.

The randomly-ordered stories were constructed by randomly sequencing all the statements in the well-formed stories. However, the order was constrained so that no two statements from any one category were in adjacent positions, and so that the setting statements and the reaction statements did not appear in their normal and respective beginning or end locations.

The fourth group of stories, the unrelated statements, was constructed by generating twelve sentences from which no obvious causal relations could be inferred. The types of information in these sentences were representative of the types of information found in well-formed stories. In each story, two statements could be classified as information belonging to a setting, four could be classified as statements belonging to either the internal response or reaction categories, and six could be classified as statements found in either an initiating event, attempt,

or consequence category. Table 2 contains an example set of unrelated statements used in this study.[2]

Insert Table 2 about here

Design

The 64 subjects were randomly assigned to one of four story organization conditions: 1) Well-Formed Stories, 2) Slightly-Disordered Stories, 3) Randomly-Ordered Stories, and 4) Unrelated Statements. Within each condition, subjects were assigned to one of two instructional treatments: 1) an Exact-Order treatment with instructions to recall the semantic content of the story as accurately as possible, while recalling the exact sequence of the story statements, or 2) a Make-A-Story treatment with instructions to recall a "good" coherent story while recalling the semantic content of the story as accurately as possible.

The resulting design was a 4 x 2 x 3 factorial with four story organization conditions (Well-Formed, Slightly-Disordered, Randomly-Ordered, and Unrelated Statements), two instructional treatments (Exact-Order and Make-A-Story), and three individual stories. Story organization and instructional treatment were between subject factors while the number of stories presented was the within subject factor.

Procedure

Each subject was tested individually by one of two experimenters. At the beginning of each session, all of the subjects were told that they were going to hear three stories. The experimenter explained that during

the presentation of the material, a pause would occur at the end of each story whereupon the subject would be informed that one story had been completed and the next was about to begin. Each subject was then given a set of specific instructions for recalling the stories. The three stories, specific to one of the four story organization conditions were then read. At the conclusion of the presentation, all subjects participated in a backward counting task, lasting approximately 20 sec. Subjects were then asked to recall each of the three stories, adhering to the specific instructions given beforehand.

After the recall task was completed, all of the subjects participated in a reconstruction task. Each story was typed on plain white paper and cut up into twelve individual sentences. The experimenter then presented the first set of twelve sentences in a random order, and each subject was asked to reconstruct the exact temporal order of the presented story. After the subject reconstructed the order of the first story sequence, the remaining two stories were presented successively in the same fashion. The order of presentation for the stories was identical to the order in the original stimulus presentation.

It should be noted that subjects in the Make-A-Story treatment were also given instructions to order each story to correspond to the exact order presented in the text structure. This procedure was adopted to examine whether these subjects would attempt to reconstruct an order more representative of the originally presented text or whether they would construct an order which conformed more to the temporal sequence they produced during recall.

Results

Recall Data

Three sets of analyses were completed on the recall data. The first focused on the number of statements accurately recalled; the second evaluated the number of inferences added to recall. The final set of analyses examined the temporal order of story statements found in recall.

Accurate recall. Protocols were scored for the number of statements accurately recalled in each of the three stories. The criterion for evaluating the accuracy of each statement was based on its semantic content. Each statement was scored as correct independent of the temporal order in which it was recalled. A statement was also evaluated independent of the changes occurring in category membership. For example, one subject recalled that Albert was a fish who loved the taste of worms, thereby changing an internal response statement (Albert knew how delicious worms tasted) to a setting statement. However, the semantic content of the recalled statement was preserved and therefore scored as correct.

The total number of accurate statements in each of the three stories was tabulated for all subjects, and an analysis of variance was carried out on these scores. The results showed that Story Organization, $F(3,56) = 23.68$; $p < .001$, and Instructional Set, $F(1,56) = 6.76$; $p < .01$, were significant as was their interaction, $F(3,56) = 3.08$; $p < .05$. There were no significant effects or interactions due to the three stories presented to each subject. Figure 1 summarizes the results of the interaction by showing the mean number of accurate statements recalled in each of the conditions.

Insert Figure 1 about here

Within each instructional treatment, a series of Duncan's multiple t-tests was carried out to determine which Story Organization conditions significantly differed from one another. Within the Exact-Order treatment, subjects receiving well-formed stories recalled significantly more information than those receiving slightly-disordered stories. In turn, subjects in the Slightly-Disordered condition recalled significantly more information than subjects in the Randomly-Ordered condition. Finally, the latter group recalled significantly more information than subjects in the Unrelated Statements condition. The same general pattern was found in the Make-A-Story treatment. However, the difference between the Slightly-Disordered and Randomly-Ordered story conditions was not significant.

The effects of Instructional Set were then examined for each type of Story Organization condition. Significant differences in performance due to instructions were found in two of the four conditions: Randomly-Ordered stories and Unrelated Statements. In these two conditions, subjects in the Make-A-Story treatment recalled significantly more information than subjects in the Exact-Order treatment. Thus, instructional set influences recall only for the less well-organized stories.

Inferences. During recall, new information, not contained in the original text structure, was added by subjects. In the Well-Formed, Slightly-Disordered, and Randomly-Ordered conditions, the main function of these inferences was to elaborate upon or extend the original story information. Elaborations often consisted of enumerating details of the

protagonist's actions or internal states not provided in the original text. In the Unrelated Statements condition, the main function of these inferences was to connect two or more statements in a more coherent fashion.

The total number of inferences generated in each story was tabulated for each subject, and an analysis was carried out on these scores. The results showed a significant main effect for Story Organization, $F(3,56) = 4.09$; $p < .03$. There were no other significant effects nor were there any significant interactions among the three variables. The result of a series of Duncan's t-tests indicated that subjects in the Unrelated Statements condition generated significantly more inferences than subjects in the other three story conditions. The mean number of inferences per story in each condition was: Unrelated Statements, 3.13; Randomly-Ordered Stories, 1.15; Slightly-Disordered Stories, 1.10; and Well-Formed Stories, .83. There were no significant differences among the latter three story conditions.

Temporal ordering strategies. To determine how accurately subjects ordered the text material, a Kendall's Tau rank order correlation, comparing the relationship between the text and recall order, was computed for each subject. The results are presented in the first two columns of Table 3.

Insert Table 3 about here

In the Exact-Order treatment, correlations ranged from .97 to .40, decreasing systematically as a function of the type of organization in

the text. Only those subjects hearing well-formed stories recailed, nearly perfectly, the temporal order of the text sequence. The mean correlation from the Slightly-Disordered condition was second in strength, the mean correlation from the Randomly-Ordered condition third, and the mean correlation from the Unrelated Statements condition fourth. In the Make-A-Story treatment, the only condition where recall order systematically corresponded to the text order was in the Well-Formed Story condition. A significant decrease in the adherence to the text order occurred in all other conditions. Thus, it is clearly evident from these results that the correct order of text violations cannot be maintained when accuracy is required and that subjects making good stories from text violations also prefer not to or cannot maintain the text order.

A comparison between the two instructional treatments showed that the accuracy of maintaining the text order differed in two of the four story conditions. When reproducing a "good" story, subjects in the Slightly-Disordered and Randomly-Ordered conditions did not recall the text order as accurately as subjects in the Exact-Order treatment.

A second set of correlations were computed to determine the reason for the inaccuracy in maintaining the text order of story violations. If a story schema does affect the organization of incoming information, then recall should correspond more to the order specified in the story grammar than to the order presented in a text violation. This type of reordering should occur, especially in conditions where subjects are deliberately using a story schema to retrieve information. In order to examine the validity of this hypothesis, a baseline correlation was

computed between the text order and story grammar order to determine the strength of correlation which should have resulted if a temporal order identical to the text order were recalled. These baseline correlations, presented in the middle column of Table 3, were .76 for the Slightly-Disordered Story condition and -.10 for the Randomly-Ordered Story condition. Because of the absence of implicit causal connections in the Unrelated Statement condition, no one order was considered to be ideal, and therefore no correlations were computed for this data.

Correlations between the recall order and the story grammar order were then established and appear in the two right hand columns of Table 3. The data indicated that in the Make-A-Story treatment, all subjects recalled the text in an order which corresponded almost identically to the story grammar order. In the Exact-Order treatment, there was a positive increase in the Tau scores when the correlations from the Slightly-Disordered and Randomly-Ordered Story conditions were compared to the respective baseline correlations. The increase indicated that a story schema had some influence on the output of story order, but these correlations did not equal the strength of those in the Make-A-Story condition.

In order to provide a more detailed description of the strategies used to organize recall in the Exact-Order treatment, the recall sequences were analyzed and classified into five different categories (as shown in Table 4): 1) a complete episode, consisting of a strict forward causal sequence; 2) a complete episode, consisting of a causal sequence with one or more temporal inversions; 3) clusters of causally related statements; 4) an unrelated statement sequence; and 5) protocols containing one or two statements.

Insert Table 4 about here

If protocols were classified in either the first or second category, the criterion for a complete episode (Stein & Glenn, 1977) had to be met. A complete episode includes a consequence, an attempt, and a statement(s) from either the initiating event or internal response category. This operational definition fulfills the general requirements of an episode described earlier in this paper.

Three separate Chi Square analyses were carried out on this data to determine whether the frequency of a specific recall strategy varied as a function of the story organization conditions. The first analyses compared the strategies used in the Well-Formed and Slightly-Disordered Story conditions. The results showed no significant differences between the two conditions ($\chi^2 = 1.88$; $p > .05$). Subjects in both conditions produced more complete episodes with forward causal sequences than complete episodes containing inversions.

The second Chi Square analysis compared the strategies used in the Well-Formed condition to those in the Randomly-Ordered condition; the third analyses compared the differences between the Slightly-Disordered and Randomly-Ordered conditions. In order to construct a 2 x 2 contingency table for each of these analyses, the strategies examined were collapsed into two categories: 1) a complete episode with a strict forward causal sequence and 2) all other strategies. The results from both analyses were significant. Subjects in both the Well-Formed ($\chi^2 = 18.88$; $p < .01$) and Slightly-Disordered ($\chi^2 = 8.47$; $p < .01$) conditions recalled more complete episodes than subjects in the Randomly-Ordered condition. In the latter condition, only 21% of all subjects reconstructed complete

episodes. It should be emphasized, however, that the majority of subjects recalling more than one or two statements did impose some type of logical structure on their recall order.

The recall sequences from the Unrelated-Statements condition were not included in this analysis because the strategies varied more than those in other conditions and were difficult to classify. However, the majority of subjects did not produce sequences that were causally related. Over 70% of the protocols could be classified as character descriptions recalled in a haphazard manner. In this condition, then, a story schema was rarely used.

Protocol from the Make-A-Story treatment were also examined to determine whether or not subjects constructed stories with complete episodes. In conditions where well-formed, slightly-disordered, or randomly-ordered stories were presented, all but three protocols contained complete episodes.

Reconstruction Data

The data from the reconstruction task was scored by calculating a Kendall's Tau rank order correlation coefficient between the text order and the order in which the subject reconstructed the story sequence. Each subject received three such scores. An analysis of variance was then carried out on the data and showed that the only significant main effect was Story Organization, $F(3,56) = 29.65$, $p < .0001$. These results are presented in Table 5. The results from a series of Duncan's t-tests showed that subjects in the Well-Formed Story condition constructed the text order significantly more accurately than subjects in any other Story

Organization condition. In turn, subjects in the Slightly-Disordered condition constructed the order of events significantly more accurately than subjects in either the Randomly-Ordered or Unrelated Sentences conditions. No significant differences were found when the latter two conditions were compared.

Insert Table 5 about here

In order to determine whether subjects in the Slightly-Disordered and Randomly-Ordered conditions were constructing sequences which conformed more to the story grammar order than to the text order, a Kendall's Tau correlation was calculated between the subject's reconstruction order and the story grammar order. The data showed that subjects were not reconstructing stories to conform more to the story grammar order than to the presented order in the text structure. In fact, subjects reconstructed stories with just as much or more disorganization than the text structure contained.

Discussion

The results from this study showed that story memory was a direct function of the match between the text structure of stories and an ideal story structure, as described in our grammar. The text of stories corresponding to an ideal structure were remembered more accurately than those containing any structural duration from an ideal structure. Subjects hearing story violations could not retrieve as much semantic content nor could they retrieve the exact order of story statements as well as subjects

hearing well-formed stories. These data add further support to Bartlett's (1932) suggestions about the importance of cognitive schema in regulating story memory and provide insight into subsequent "failures" to replicate his original results.

Bartlett (1932) argued that recall of stories was never an exact replica of the text structure, but instead underwent blending, omissions, additions, and transformations. Gomulicki (1956) and consequently Zangwill (1972), however, came to the conclusion that Bartlett's results were not ordinarily found in the recall of most prose and story passages. Both of these investigators felt that because the predominant error in recall was one of omission, recall was better characterized as an abstractive process rather than as constructive.

In arguing this point, however, neither Gomulicki nor Zangwill seriously considered the role of cognitive schemata in recall, nor the degree to which a text structure corresponded to these higher order cognitive structures. Consequently, neither text organization nor higher order cognitive structures were specifically described by these investigators.

When these two factors were considered in the present study, the data showed that one of the predominant errors in recall was one of omission. However additions of new information, as well as other transformations, occurred and both were a function of the degree of correspondence between the text and underlying cognitive story structures. We would argue that it is the isomorphic correspondence between incoming information and underlying cognitive structures which allows a subject to

construct and retrieve an accurate representation of stories, not that story memory is an abstractive process.

A major question which still remains concerns the degree of reorganization occurring in recall when a text violates the description of an ideal structure. Our data showed that story recall conformed more to an ideal story structure than to the text structure, but the degree of reorganization was significantly influenced by the type of story violation presented. When minimal order violations occurred, more subjects recalled story sequences identical to the sequence described in an ideal story structure than when maximal order violations occurred. In conditions where the text structure of stories violated the causal relations specified by a story schema, sequences corresponding to a story schema were rarely recalled.

Two factors which appear to be critical in determining the quality of reorganization during retrieval are the demands upon working memory if a story schema were activated and the quality of information retained about the structure of a specific violation. Both of these factors are dependent upon the similarity between the text structure and an ideal story structure. If the similarity is high, the demands on working memory would not be excessive to transform incoming information to correspond to an ideal structure. Furthermore, the information retained about the exact inversion occurring in the text structure may be quite inaccurate. Thus, in an effort to retain a semantically coherent representation a story schema would be activated to reorganize incoming information.

When the similarity is minimal, however, the quality of information about the structure of the text may sufficiently interfere with the reorganizational processes during retrieval. Both the reconstruction data and spontaneous comments produced during recall indicated that subjects were very aware when randomly-organized stories had been presented. That is, subjects told the experimenter that stories were all mixed up and during reconstruction attempted to reproduce random sequences. Thus, although subjects could not remember the order of story events in randomly-ordered stories with a high degree of accuracy, they could classify the stories as randomly ordered. This type of knowledge may be very effective in inhibiting the most effective and active use of a story schema. Furthermore, the number of transformations necessary to produce a semantically coherent representation may exceed the limitations of working memory even if a schema were activated.

Although the data do not directly illustrate the importance of these factors, they do indicate the complexity involved in predicting the quality of reorganization occurring during retrieval, especially when an "accurate" representation of incoming information is requested. Memory for stories is not a simple process of fitting incoming information into available "slots" in a schema, but rather involves an active construction of a representation affected by a series of factors.

The comparison between the two instructional treatments, however, showed that information can be reorganized to correspond to an ideal story structure. When required to deliberately use a story schema to organize information, subjects reproduced stories almost identical to the

description of an ideal story structure. In this condition, the type of story violation was not a factor in predicting the quality of reorganization occurring during recall. Even subjects hearing randomly-ordered stories and unrelated statements constructed "good" stories according to the description of an ideal structure.

Differences in recall accuracy due to prior instruction also have two important implications for a theory of instruction. First, only when there were large discrepancies between the text structure and an ideal structure did the type of instructional treatment affect the amount of accurate recall. The accuracy of recall in the Well-Formed and Slightly-Disordered Story conditions did not differ as a function of instructional set. Again, these results illustrate the importance of describing prior knowledge structures before testing the effects of different instructions on recall accuracy.

Second, although differences in instruction did affect the amount of accurate information recalled, the organization of the text structure remained a critical factor in determining the accuracy of recall. Well-formed stories were always the most accurately recalled in both instructional treatments and the pattern of declining accuracy scores for the three story violations were identical across instructional set. It is apparent that even when instructions do facilitate retrieval, the amount of time necessary to encode and retrieve the most accurate representation of story violations increases as a function of the match between a text structure and an ideal story structure.

The results from an experiment by Kintsch, Mandel, and Kozminsky (1977) provide some related support for our hypothesis. These investigators presented subjects with stories that were either well-formed or violated the normal order of story sequences by rearranging the order of paragraphs. Subjects were then given "free" reading time or restricted time and then told to summarize the stories. In the "free" reading condition, there were no differences between the summaries written for well-formed or disorganized stories. However, the time taken to read the two types of passages differed, with well-formed stories being read faster than disorganized stories. In the restricted reading condition, differences between the goodness of summaries was found, with better summaries written for well-formed stories than for disorganized stories. Thus, if subjects are given a sufficient amount of time, the integration of information from a disorganized story can be accomplished so that summaries are as semantically cohesive as those from well-formed stories. However, when time to read is restricted subjects have difficulty completely restructuring the material and then producing good summaries.

In summary, this study illustrated the powerful effects of using a story schema during retrieval and the importance of the correspondence between a text and ideal story structure. Although the data did not illustrate how a schema influences different stages of processing story information, the results suggested that the process of representation is a complex one, depending upon both the text structure and prior knowledge about stories. It is clear, however, that future studies should be directed to the potential different effects that story schema can have upon encoding, representation, and retrieval.

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Footnotes

[1]The story structure presented above is an ideal form. In fact, stories can contain many variations of this form. For example, stories often contain many episodes related to one another by different types of connectors (AND, THEN and CAUSE). The structure of a single episode also has certain permissible variations. For example, the internal response and reaction categories can be omitted, and in specific instances, the episode can begin with the internal response. For the purposes of this study, however, single episodes containing all relevant categories were constructed.

[2]Individual sentences in the set of Unrelated Statements could be classified into more than one category for the following reason. Category membership is dependent upon the type of information in a statement and its functional role in a story (determined by its location and causal relationship to other story statements). By eliminating the implied causal relationships among statements, the specificity of exact category membership was also eliminated.

Table 1

Categories in a Simple Story and an Example of a Well-Formed Story

	Categories Included in a Simple Story
1. Setting	- Introduction of the protagonist; can contain information about physical, social, or temporal context in which the remainder of the story occurs.
2. Initiating Event	- An action, an internal event, or a natural occurrence which serves to initiate or to cause a response to the protagonist.
3. Internal Response	- An emotion, cognition, or goal of the protagonist.
4. Attempt	- An overt action to obtain the protagonist's goal.
5. Consequence	- An event, action, or endstate which marks the attainment or non-attainment of the protagonist's goal.
6. Reaction	- An emotion, cognition, action or endstate expressing the protagonist's feelings about his goal attainment or relating the broader consequential realm of the protagonist's goal attainment.

	Example of a Well-Formed Story
Setting	1. Once there was a big gray fish named Albert 2. who lived in a big icy pond near the edge of a forest.
Initiating Event	3. One day, Albert was swimming around the pond 4. when he spotted a big juicy worm on top of the water.
Internal Response	5. Albert knew how delicious worms tasted 6. and wanted to eat that one for his dinner.
Attempt	7. So he swam very close to the worm 8. and bit into him.
Consequence	9. Suddenly, Albert was pulled through the water into a boat. 10. He had been caught by a fisherman.
Reaction	11. Albert felt sad 12. and wished he had been more careful.

Table 2

An Example of an Unrelated Sentence Set

There was a little girl named Alice.
Alice lived in a house near the forest.
Alice sat down on the couch.
Alice heard footsteps outside the door.
Alice loved to look at swans in the lake.
She wanted a hammer and saw.
Alice ran quickly through the forest.
Alice picked up a gold key on the floor.
The rain made a hole in her roof.
Alice found the puzzle hidden in the closet.
Alice knew John wanted the car.
She thought she had made a mistake.

Table 3

Results from Correlational Analyses on Temporal Ordering Strategies in Recall

	TO X RO		TO X SGO	SGO X RO	
	Instructional Treatment			Instructional Treatment	
Story Condition	Exact Order	Make-A-Story		Exact Order	Make-A-Story
Well-Formed	.98	.97	1.00	.98	.97
Slightly Disordered	.72	.61	.76	.82	.93
Randomly Ordered	.50	-.07	-.10	.20	.91
Unrelated Statements	.40	.48	---	---	---

TO = Text Order

RO = Recall Order

SGO = Story Grammar Order

Table 4

Proportion Scores for the Five Types of Temporal Ordering Sequences Produced Upon Recall in the Exact-Order Treatment

Temporal Ordering Strategies	Story Conditions		
	Well Formed	Slightly Disorganized	Randomly Organized
A. Complete forward causal sequence	.88	.67	.21
B. Forward causal sequence with marked inversions	.12	.33	.29
C. Clusters of causally related statements	---	---	.08
D. Unrelated statements	---	---	.13
E. Protocols containing one or two statements	---	---	.29

Table 5

Mean Tau Scores for Each Story Organization Condition on the Reconstruction Task

Story Organization	TO X RCO	TO X SGO	SGO X RCO
Well-Formed	.97	1.00	.97
Slightly Disordered	.78	.76	.60
Randomly Ordered	.23	-.10	.10
Unrelated Sentences	.23	---	---

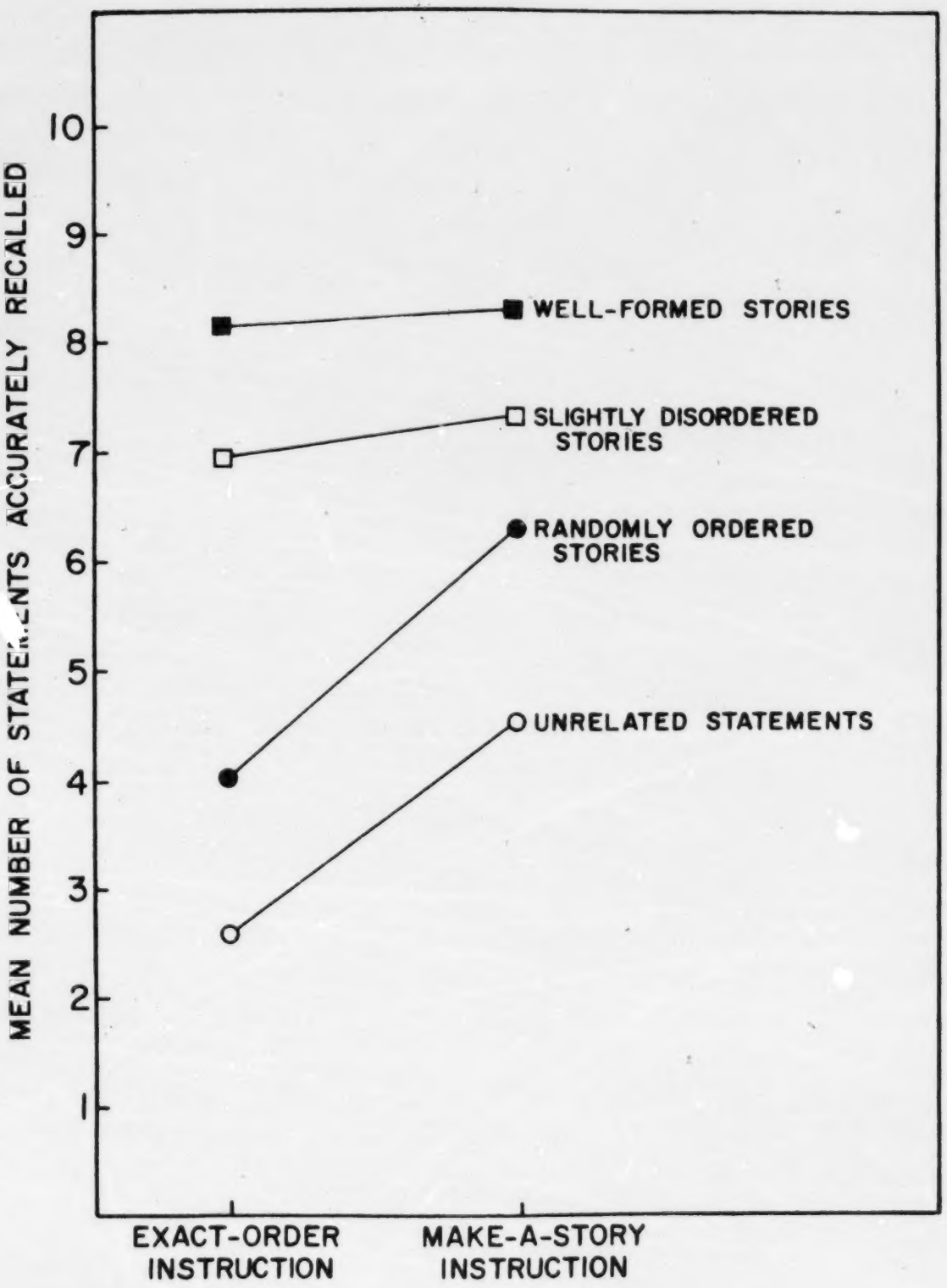
TO = Text Order

RCO = Reconstructed Order

SGO = Story Grammar Order

Figure Caption

Figure 1. Mean number of statements accurately recalled in each condition.


MEAN NUMBER OF STATEMENTS ACCURATELY RECALLED
10
9
8
7
6
5
4
3
2
1
WELL-FORMED STORIES
SLIGHTLY DISORDERED STORIES
RANDOMLY ORDERED STORIES
UNRELATED STATEMENTS
EXACT-ORDER INSTRUCTION
MAKE-A-STORY INSTRUCTION

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